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A JOHNE'S DISEASE SURVEY

BY

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Johne's disease is world-wide in distribution and is particularly prevalent where intensive dairy farming is practised.

Although the first recorded case of the disease dates back only to 1895, there is little doubt that it has been present in this country for a much longer time and has been the cause of sufficiently heavy mortality among cattle to draw attention to its presence. A survey by McGregor (1934) of the literature of the eighteenth and early nineteenth centuries suggests that the disease has been the cause of considerable loss among cattle for over 150 years in England. It was, however, only during the early part of the present century that any serious attempt was made to investigate it, and, although considerable and valuable information has been obtained on certain aspects of the problem, no reliable method of early diagnosis or measures for its control have yet been evolved.

Twort and Ingram (1913) estimated the yearly loss caused by it among dairy cattle in Great Britain to be at least £500,000; this sum did not include losses in beef herds or the extra value of pedigree stock. It would appear from the literature of the past 20 years that the general opinion is that the disease is steadily increasing in most countries; this is perhaps not surprising as there is no reliable method of control and even the most elementary precautions for preventing it spreading are usually neglected.

Williams (1927) estimated the losses in American herds at from 2 to 12 per cent. in addition to the indirect losses represented by decreased milk production and general unthriftiness. Houthuis (1932) believed the disease was increasing in some areas in Holland, where there was an annual loss of 12 to 15 per cent. He attributed the increase to the dissemination of infection by clinical cases and the selling of early cases by observant owners.

Gaiger (1932) had difficulty in finding a few farms in Lancashire and Cheshire free of the disease and on which there was no record of cases having occurred. Dunkin (1934) referred to the huge financial loss caused by the disease in England. He was of the opinion that it must in certain areas be given first place among the major cattle diseases.

Rinjard (1934) in France stated that it had spread in a period of 20 years from two to 41 departments. He estimated the annual loss in one department in the North-West at 24,500 cattle worth 25,000,000 to 30,000,000 francs.

Sims, Mohler and Johnson (1942) found the disease in both beef and dairy herds in America and believe that it is much more prevalent than is generally realised.

PRESENT ENQUIRY

The object of this survey was to obtain information on the incidence and distribution of the disease so that its economic importance to the livestock industry could be assessed. Although little information is available of its incidence before 1939, it is known that it was prevalent in many parts of England; but some change may have been brought about since then by the greatly increased acreage ploughed and the change over from permanent pastures to new leys. The ploughing of infected permanent pastures must have reduced to some extent the risk of animals contracting the disease, but against this is the probability that it has resulted in many instances in a heavier concentration of animals on a smaller grazing area with perhaps a relatively greater risk of contracting infection. It is recognised that accurate information of its incidence cannot be obtained easily because of the large number of unthrifty animals that are sent to grading centres, knackeries and kennels without diagnosis being made of the condition affecting them, but many of which are undoubtedly affected with Johne's disease. Many owners of infected herds develop a remarkable skill in detecting early signs of the disease and get rid of the animals while still in fair condition. Some of these animals are disposed of at sales and, unsuspected by their new owners, introduce the disease into their herds and thus it is being gradually disseminated throughout the country. Another factor that may have affected the incidence during the war and in the post-war period is the considerable lowering of the nutritive value of the diet of dairy cattle and, particularly, young growing stock; and poor diet is probably an important contributory factor in the pathogenesis of the disease. It was hoped that this survey would provide also information on the relative susceptibility of different breeds of cattle and, perhaps, of the relationship of age to susceptibility.

PROCEDURE

Veterinary surgeons throughout the country were asked to assist in making the survey by sending to the Laboratory samples of faeces from animals which, in their opinion, were clinically affected with the disease. The age and breed of each animal was given with the sample and in some instances the tuberculous status of the herd. A direct smear was made of the faeces and stained by the Ziehl-Neelsen method. Several techniques were tried for concentrating the acid-fast bacilli, but none was found to be any improvement on a direct smear; similar results were obtained by Houthuis (1932), Cauchemez and Sergent (1934) and Levy (1948). A standard was laid down for "positive" diagnosis and rigidly adhered to throughout the survey. It was decided that only those smears in which "groups" of typical *M. johnei* were found would be accepted as positive. Smears in which "groups" could not be found, but in which isolated typical bacilli were present, were diagnosed as "suspicious." Smears in which no typical bacilli were found were recorded as negative.

SPECIMENS EXAMINED

A total of 3,815 faeces samples were sent in by 205 veter-

inary surgeons from 30 counties (see Chart No. 1); of these, 976 (25 per cent.) were positive, 739 (19 per cent.) suspicious and 2,096 (54 per cent.) negative. Levi (1948) made microscopic and cultural examinations of 91 faeces samples from suspected cows. He found 35 (38 per cent.) positive by microscopic examination, 33 (36 per cent.) suspicious and 23 (15 per cent.) negative. Of those positive to microscopic examination 90 per cent. were confirmed by culture.

Distribution of the Disease

The distribution of the disease as shown on the map does not give a true picture, as many more samples were received from some counties than from others, and only a few from some known heavily infected areas. While it is not possible, therefore, to compare the incidence in different parts of the country, it is clear that the disease is widely distributed. Furthermore, as no attempt has been made in the past to estimate the incidence, it is difficult to say whether it is now becoming more prevalent; but many veterinary surgeons, stock owners and knackers are convinced that it has increased markedly during recent years.

JOHNE'S DISEASE SURVEY 1946-49

Breeds of Cattle

All breeds of cattle are susceptible to the disease and there is no evidence that any particular breed is more susceptible than another. There would appear to be a general belief that Channel Island cattle are particularly susceptible, but the information obtained in this survey does not support that view. The onset of the disease is favoured by any circumstance that lowers bodily resistance, so the combined strain of breeding and milk production in young animals that have not achieved full growth probably contributes to the severity of the infection frequently observed in Channel Island breeds.

As a matter of interest the number of samples examined from different breeds are set out in Chart No. 2.

Age in Relation to Susceptibility

The effect of age upon susceptibility to Johne's disease is a matter of interest and of considerable practical importance as it is closely related to measures of control. By age susceptibility is here understood the period during which animals can contract infection and subsequently develop the principal clinical symptom—persistent diarrhoea. It may well be that animals that have passed the most susceptible age can contract infection and recover or become temporary or permanent carriers without exhibiting diarrhoea. The investigations of Meyer (1913) and M'Fadyean and Sheather (1916) suggested that it is the very young animal that is most susceptible. Hagan (1938) recorded that in an infected herd, maintained under experimental conditions, no animal contracted the disease naturally when exposed after four months of age. There was also a marked age resistance among animals given large doses of *M. johnei per os* as none over two years of age became clinically affected. The experimental evidence reported on this aspect of the disease, although limited, clearly establishes that young animals are particularly susceptible and that with increasing age susceptibility diminishes. But there is apparently no experimental evidence as to whether a susceptible animal, when brought in contact with infection for the first time as an adult, can become infected and either remain a carrier or develop clinical disease. It will be seen from Chart No. 3 (page 358) that the analysis of 648 clinical cases shows the peak of infection to be between two and five years of age, and that 41 clinical cases occurred between the ages of seven and 13 years. It is impossible to say when these animals contracted infection; they may have contracted it during early life and remained carriers until some adverse condition re-activated it, or they may have picked it up during adult life. Houthuis (1932), observed in Holland that the disease chiefly affected animals from two and a half to four years of age, but he found also clinical infection in animals of from six to over 14 years of age. If it is correct that animals can contract natural infection only during the first four months of life, the period of incubation must frequently be considerably longer than is generally estimated. It should be remembered here that the resistance of older animals to other diseases is chiefly the result of exposure to infection during early life.

Discussion

There would appear to be some difference of opinion on the value of microscopical examination of faeces for the differential diagnosis of Johne's disease; the views here stated are based on the experience gained from the examination of a fairly large number of specimens. We believe that the causal organism of Johne's disease, *M. johnei*, can with experience readily be distinguished morphologically from the saprophytic acid-fast bacilli found in faecal smears. It is on an average somewhat smaller and usually stains more deeply with carbol fuchsin than bovine type

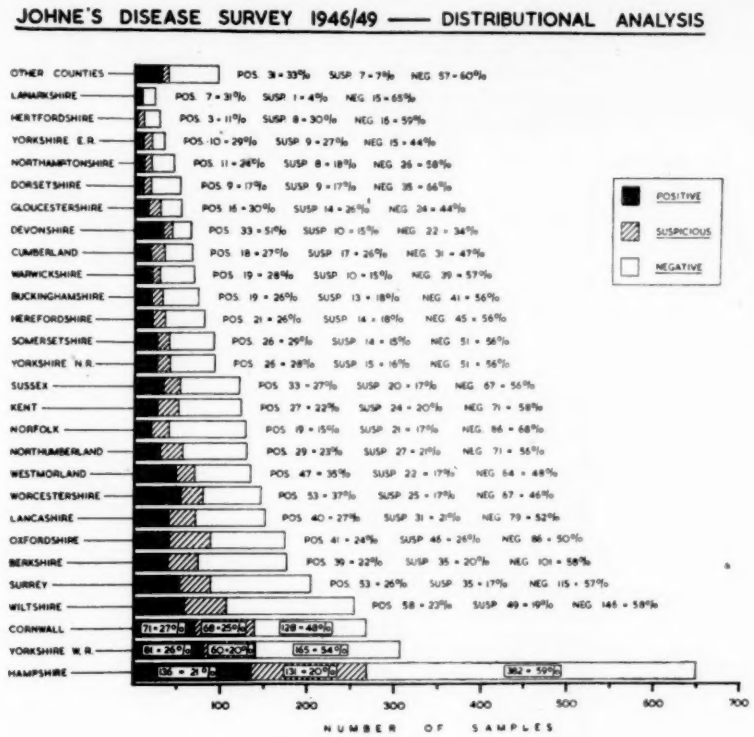
JOHNE'S DISEASE SURVEY 1946/49 —— DISTRIBUTIONAL ANALYSIS
OTHER COUNTIES POS. 31 = 33% SUSP. 7 = 7% NEG. 57 = 60%
LANARKSHIRE POS. 7 = 31% SUSP. 1 = 4% NEG. 15 = 65%
HERTFORDSHIRE POS. 3 = 11% SUSP. 8 = 30% NEG. 16 = 59%
YORKSHIRE E.R. POS. 10 = 29% SUSP. 9 = 27% NEG. 15 = 44%
NORTHAMPTONSHIRE POS. 11 = 24% SUSP. 8 = 18% NEG. 26 = 58%
DORSETSHIRE POS. 9 = 17% SUSP. 9 = 17% NEG. 35 = 66%
GLOUCESTERSHIRE POS. 16 = 30% SUSP. 14 = 26% NEG. 24 = 44%
DEVONSHIRE POS. 33 = 51% SUSP. 10 = 15% NEG. 22 = 34%
CUMBERLAND POS. 18 = 27% SUSP. 17 = 26% NEG. 31 = 47%
WARWICKSHIRE POS. 19 = 28% SUSP. 10 = 15% NEG. 39 = 57%
BUCKINGHAMSHIRE POS. 19 = 26% SUSP. 13 = 18% NEG. 41 = 56%
HEREFORDSHIRE POS. 21 = 26% SUSP. 14 = 18% NEG. 45 = 56%
SOMERSETSHIRE POS. 26 = 29% SUSP. 14 = 15% NEG. 51 = 56%
YORKSHIRE N.R. POS. 26 = 28% SUSP. 15 = 16% NEG. 51 = 56%
SUSSEX POS. 33 = 27% SUSP. 20 = 17% NEG. 67 = 56%
KENT POS. 27 = 22% SUSP. 24 = 20% NEG. 71 = 58%
NORFOLK POS. 19 = 15% SUSP. 21 = 17% NEG. 86 = 68%
NORTHUMBERLAND POS. 29 = 23% SUSP. 27 = 21% NEG. 71 = 56%
WESTMORLAND POS. 47 = 35% SUSP. 22 = 17% NEG. 64 = 48%
WORCESTERSHIRE POS. 53 = 37% SUSP. 25 = 17% NEG. 67 = 46%
LANCASHIRE POS. 40 = 27% SUSP. 31 = 21% NEG. 79 = 52%
OXFORDSHIRE POS. 41 = 24% SUSP. 46 = 26% NEG. 86 = 50%
BERKSHIRE POS. 39 = 22% SUSP. 35 = 20% NEG. 101 = 58%
SURREY POS. 53 = 26% SUSP. 35 = 17% NEG. 115 = 57%
WILTSHIRE POS. 58 = 23% SUSP. 49 = 19% NEG. 146 = 58%
CORNWALL 71 = 27% 68 = 25% 129 = 48%
YORKSHIRE W.R. 61 = 26% 60 = 20% 165 = 54%
HAMPSHIRE 136 = 21% 131 = 20% 382 = 59%
POSITIVE
SUSPICIOUS
NEGATIVE
100 200 300 400 500 600 700
NUMBER OF SAMPLES

CHART No. 1

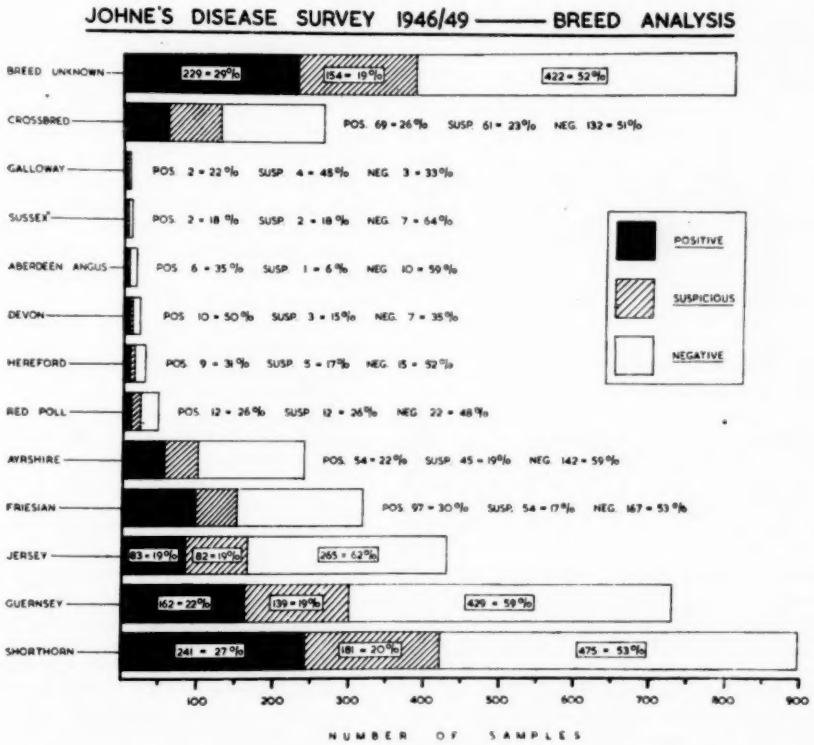
JOHNE'S DISEASE SURVEY 1946/49 —— BREED ANALYSIS
BREED UNKNOWN 229 = 29% 154 = 19% 422 = 52%
CROSSBRED POS. 69 = 26% SUSP. 61 = 23% NEG. 132 = 51%
GALLOWAY POS. 2 = 22% SUSP. 4 = 45% NEG. 3 = 33%
SUSSEX POS. 2 = 18% SUSP. 2 = 18% NEG. 7 = 64%
ABERDEEN ANGUS POS. 6 = 35% SUSP. 1 = 6% NEG. 10 = 59%
DEVON POS. 10 = 50% SUSP. 3 = 15% NEG. 7 = 35%
HEREFORD POS. 9 = 31% SUSP. 5 = 17% NEG. 15 = 52%
RED POLL POS. 12 = 26% SUSP. 12 = 26% NEG. 22 = 48%
AYRSHIRE POS. 54 = 22% SUSP. 45 = 19% NEG. 142 = 59%
FRIESIAN POS. 97 = 30% SUSP. 54 = 17% NEG. 167 = 53%
JERSEY 83 = 19% 82 = 19% 265 = 62%
GUERNSEY 162 = 22% 139 = 19% 429 = 59%
SHORTHORN 241 = 27% 181 = 20% 475 = 53%
POSITIVE
SUSPICIOUS
NEGATIVE
100 200 300 400 500 600 700 800 900
NUMBER OF SAMPLES

CHART No. 2

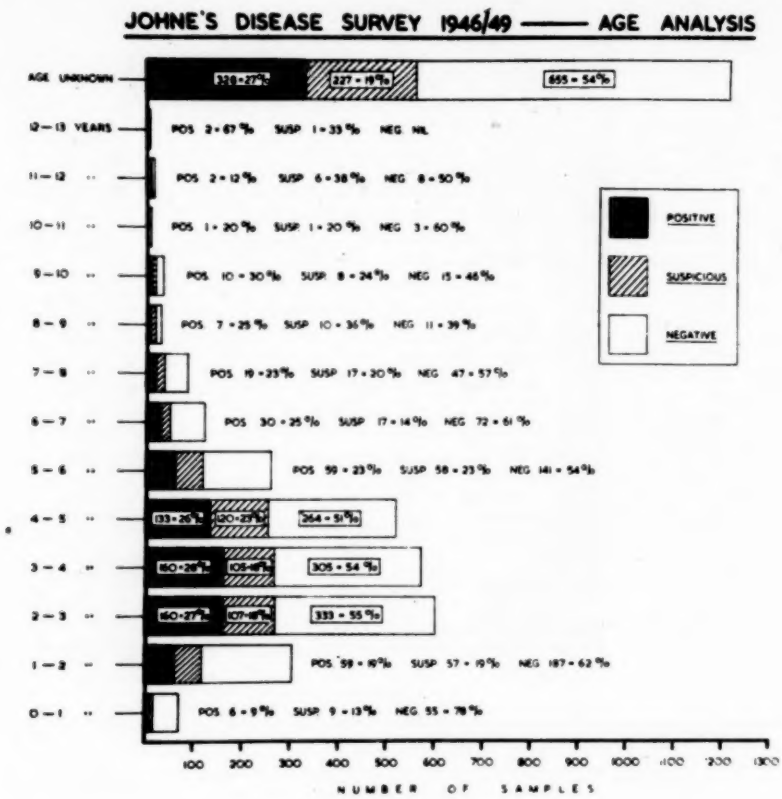

CHART No. 3

tubercle bacilli; and tubercle bacilli are not likely to be present in faeces, except in cases of advanced tuberculosis of the lungs. The criterion of infection, mentioned earlier, was rigidly adhered to throughout the work. A positive diagnosis appeared to be highly accurate and was confirmed in many cases by *post-mortem* examination. A diagnosis of " suspicious " erred usually in being over-cautious, as the majority of the specimens in this category were probably from infected animals, but did not comply with the standard laid down for positive cases. Most of them were from animals exhibiting symptoms suggestive of the disease and smears contained isolated, typical, acid-alcohol-fast bacilli, but as " groups " were not found they were returned as suspicious, although we believe a positive diagnosis would have been justified. Many of these suspicious cases were on later examination proved to be positive. When persistent, watery diarrhoea is present, it is usually necessary to make repeated examinations before the typical acid-fast bacilli can be found. In several advanced clinical cases repeated smears of faeces and of rectal mucous membrane were negative, yet on *post-mortem* examination smears of bowel scrapings or sections of the intestinal wall confirmed the presence of the disease. The examination of faecal smears from apparently normal animals in infected herds with the object of detecting early cases of the disease appeared to be of little value. It is usually only when diarrhoea is present and abnormal shedding of the intestinal mucous membrane occurs that the bacilli are excreted in sufficient numbers to be detected in smears. This would suggest that the animal affected with diarrhoea is the main factor in the dissemination of infection; the symptomless " carrier " cannot, however, be ignored, as, in addition to being a potential spreader of infection, it presents a serious problem inasmuch as it is not suspected.

It is not possible to estimate the full economic importance of Johne's disease to the livestock industry because of insufficient data on its incidence in cattle and the almost complete lack of data on its incidence in sheep. But it would appear from the information obtained in this small survey and from the opinions of veterinary surgeons and stock owners that the disease is the cause of serious and widespread mortality in many dairy and pedigree herds and must be placed high on the list of major diseases of cattle. It would appear, also, to be the general opinion that there has been a marked increase in its incidence during recent years.

There is no reliable method at present for the diagnosis of pre-clinical cases and it is impossible, therefore, to prevent the introduction of infection into a herd with a newly purchased animal. Furthermore, unless the first signs of infection are recognised and the animal sent immediately for slaughter it must almost invariably be written off as a total loss, as, once diarrhoea intervenes, bodily condition is rapidly reduced. The loss of carcase value is one of the most serious economic features of the disease.

It is probable that the majority of animals bred in heavily infected herds contract the disease during early life and overcome it without exhibiting characteristic symptoms; a

varying percentage (5 to 20) develop clinical infection and these almost invariably die or have to be slaughtered.

SUMMARY

A total of 3,815 samples of bovine faeces obtained from 30 counties were examined microscopically for *M. johnei*; of these 976 (25 per cent.) were positive, 743 (19 per cent.) suspicious and 2,096 (54 per cent.) negative.

Acknowledgments.—To Mr. E. C. Wright, Mr. Andrews and Miss L. Timms for technical assistance; and to all those veterinary surgeons who co-operated in the scheme.

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T.U.C. ADVOCACY OF PUBLIC OWNERSHIP OF THE MEAT TRADE

The General Council of the T.U.C. has approved the terms of a statement, for submission to the Minister of Food, advocating the public ownership of meat importing, slaughtering, and wholesaling under the control of a meat commission appointed jointly by the Ministers of Food and Agriculture. The memorandum (says *The Farmers' Weekly*) was prepared in conjunction with the Unions directly concerned. The General Council has already had one meeting with the Minister of Food on the subject.

"The proposals envisage a commission made up of independent members, not representative of sectional interests in the industry but including people of experience in the trade having a knowledge of the interest of workpeople. There would be much decentralisation in the commission, which would begin its duties when the present system of control ended.

"It is recognised, a statement said, that world supply difficulties may make it inadvisable to end the present system of importing at an early date. There should, however, be a review of compensation payments to pre-war importers which have been going on for nearly 12 years and for which there is often little or no return.

"Of home produced meat, the T.U.C. says that, while a case can be made out for a livestock marketing board—which would, among other things, run collecting centres—this body should play no part in meat supply and distribution beyond the point where the guaranteed price comes into effect. Any marketing board should be more representative of the interest of the consumer and the worker."

* * * * *

WEEKLY WISDOM

Planning will fail of its full purpose unless it secures the goodwill of the public and their intelligent co-operation.—Nature.

* * * * *

Have Horses Long Memories?—Mr. A. HART, M.R.C.V.S., of Ardnacoan, Argyll, writes: "In 1912 I operated on a two-year-old cart colt for scrotal hernia. The colt made a normal recovery. Three years later the owner asked me to look at a horse and during conversation mentioned that the colt I had operated upon was in the adjacent stall, and was quite normal and very quiet. I said I would like to examine the horse, but when about to do so he started to kick most viciously, becoming worse when I tried to continue the examination. The owner was very much surprised at this behaviour as he had never seen the horse kick before and anyone could handle it. Did the horse remember me or my voice?"

SOME OBSERVATIONS ON JOHNE'S DISEASE

BY

R. H. SMYTHE,

NOTTINGHAM

The graphs and the table in this contribution are intended to supplement the paper presented under the same title at the annual general meeting of the Western Counties Division held at Exeter on March 23rd, 1950, and published in *The Veterinary Record*. **62.** 429.

The observations relate mainly to the disease as seen in cows which have been slaughtered since that date and refer also to certain cows known to be affected which remain alive and apparently in good health. The table provides a summary of the cases recorded from the commencement of the investigation.

All the animals concerned are contained in the three herds described in the original paper.

In all probability the reaction to the intradermal avian tuberculin may be the response to the presence within the bovine body of any one of a variety of non-specific organisms and it is not suggested that it is generally to be regarded as an indication of the presence of Johne's bacilli in every herd in which the reaction is encountered.

It is equally probable, however, that the reaction may occur as a response to their presence in a far greater proportion of cases than many observers at present care to believe. It is the opinion of the writer, based on a deal of evidence and lengthy observation, that Johne's bacilli are present in a considerable proportion of our herds as harmless commensals and that it is less usual for them to assume the rôle of harmful pathogens. In herds such as we are dealing with in this paper, we know that a large number of individual cows are carrying this organism and it will be seen by the table that a number of these cows remain in apparent health, continue to milk well and even become fat for the butcher (Nos. 1, 4, 5, 6, 7, 10, 11, 16, 19, and 22 in accompanying table). Others develop or possess a low resistance, encounter massive infections or are overcome by an increase in the virulence of the organism.

The results of the present investigation point to the fact that in, at least, herds of this type, the response to the intradermal injection of avian tuberculin is influenced by the presence of Johne's bacilli within the bowel and that the nature of the response bears a relationship to the degree of infection and the reaction to that infection on the part of the animal. In the young animal, sheltered from infection during calfhood, a high avian reading may indicate a recent infection. If the resistance is normal or high, the level of the reading will persist with some slight undulations, but if the animal is unable to withstand the invasion the level of the avian reading will drop *rapidly* to a low level and the animal will succumb. (See graphs Nos. 3 and 4.) The undulating graph is typical of those encountered throughout these herds. (See graphs Nos. 1 and 2.) In the older animals, too, a *sudden* sharp descent from a high reading to a low precedes the majority of cases ending in clinical collapse. (See graph No. 5.)

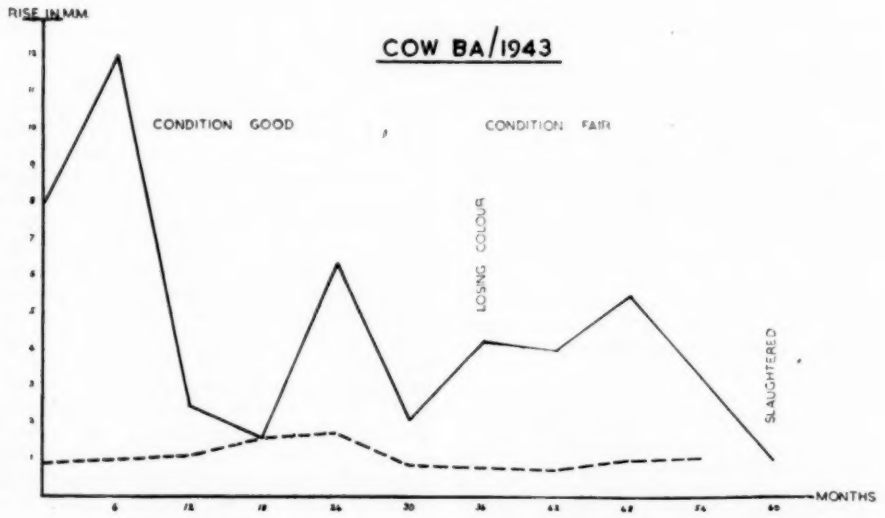
Frequently the fall occurs in steps; first a short fall followed by a temporary flattening out of the graph, then a repetition or series of repetitions. (See graphs Nos. 1 and 2.)

TABLE

	Animal age and breed			Maximum rise in avian reading in mm.	Final reading avian reaction in mm.	Faeces examination	Termination	Remarks
1.	ACE	1944	Sh.	10	2	+	Slaughtered in good condition	Suspected from Graph
2.	HR	1945	Fr.	11	2	—	,, , clinical break down	
3.	JOD	1946	Fr.	8	4	—	,, ,, ,,	
4.	BP	1943	Sh.	9	3	+	Slaughtered in good condition	Suspected from Graph
5.	BFG	1943	Sh.	5	0	—?	,, ,, ,,	,, ,,
6.	AAX	1944	Sh.	10	2	+	,, ,, ,,	,, ,,
7.	DF	1943	Sh.	10	1	—?	,, ,, ,,	,, ,,
8.	AHB	1942	Sh.	15	2	—	,, ,clinical break down	
9.	ML	1944	Fr.	7	0	—?	,, ,, ,,	
10.	GH	1943	Sh.	13	2	—	,, in good condition	Suspected from Graph
11.	BA	1943	Sh.	12	1	Negative on several occasions	,, in fair condition	Graph 1
12.	HP	1946	Fr.	11	2	+	,, ,clinical break down	
13.	ADF	1947	Sh.	9	4	—	,, in poor condition	,, 4
14.	BI	1947	Sh.	10	2	Negative on many occasions	,, ,, fair ,,	,, 3
15.	BBA	1945	Fr.	7	1	—	,, ,, poor ,,	,, 5
16.	BAB	1945	Fr.	7	1	+	Sold fat	Graded. No *post-mortem* examination. Graph 6
17.	FH	1944	Fr.	6	0	+	Slaughtered, clinical break down	Graph 2
18.	AOF	1945	Fr.	12	3	Negative on many occasions	,, in poor condition	
19.	ACF	1944	Fr.	10	1	+	Alive in good condition	Injected twice vitamin D_2. Graph 7
20.	AAA	1944	Fr.	6	2 rising to 5	+	,, ,, ,,	Injected twice vitamin D_3. Graph 7
21.	F	1945	Fr.	5	2	+	,, ,, ,,	Injected twice vitamin D_6. Graph 7
22.	ACB	1943	Fr.	6	2	—??	,, ,, ,,	Injected twice vitamin D_6. Graph 7

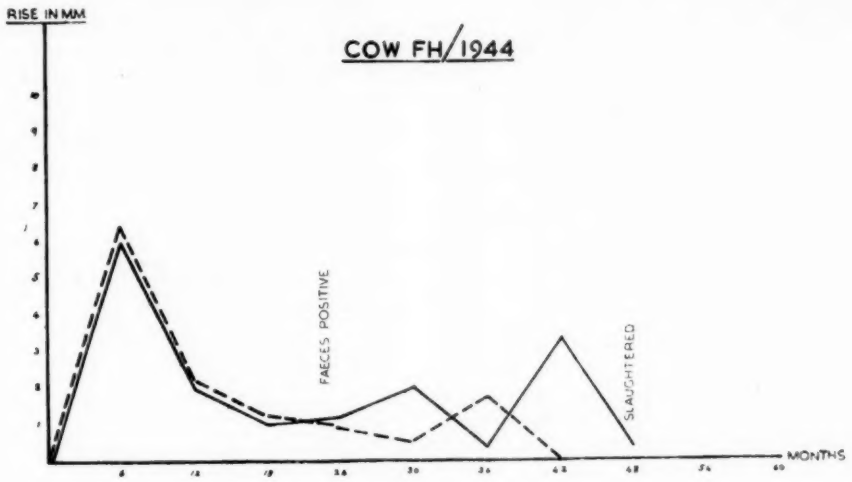
N.B.—Johne's disease has been confirmed on *post-mortem* examination macroscopically and microscopically in all cows slaughtered excepting BAB 1945, in which case no *post-mortem* examination could be made.

Please note that in this series of graphs, the avian reactions are shown as a continuous line and the mammalian reactions as a stippled line.

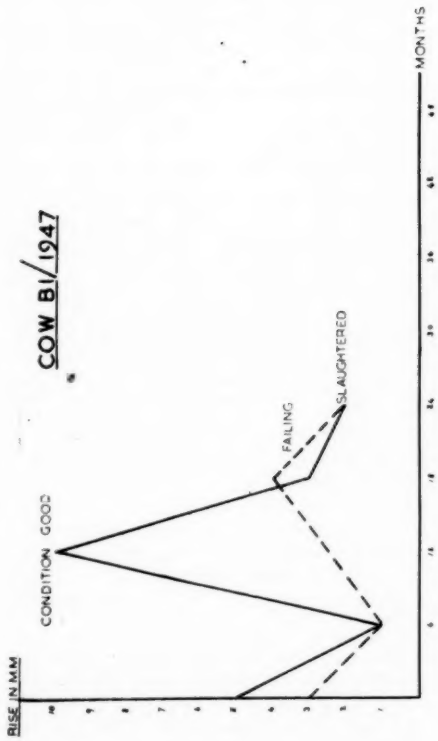


Faeces negative throughout. No scouring at any time. Extensive lesions including perirectal oedema on *post-mortem* examination

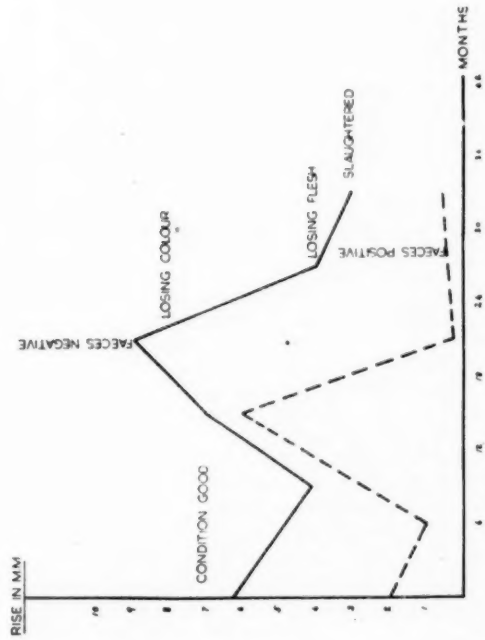
No. 1



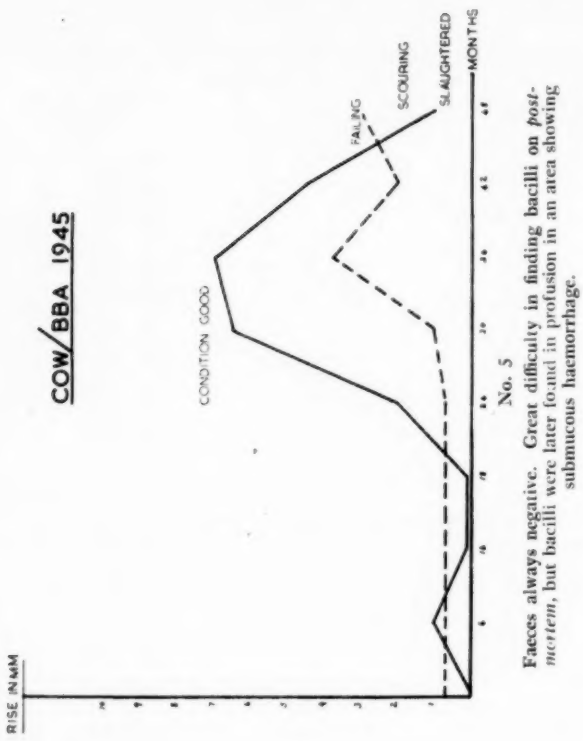
No. 2
No diarrhoea throughout



No. 3
Faeces always negative. No scouring. *P.M.* lesions confined to large intestine and rectum. Perirectal oedema present

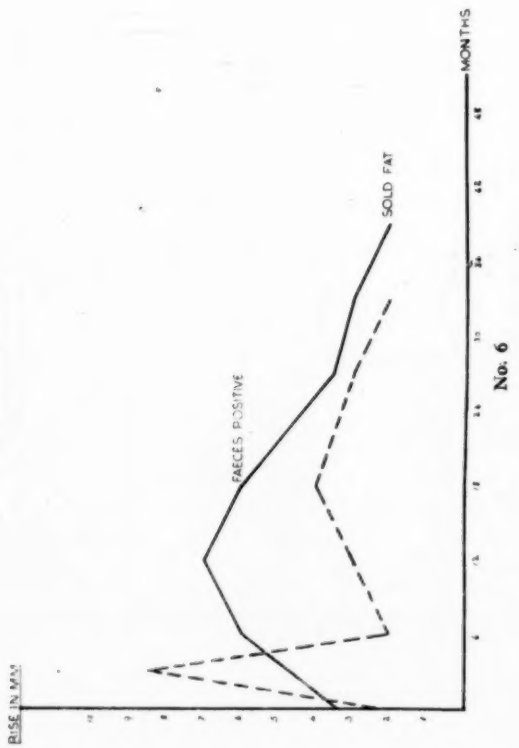


No. 4
Extensive intestinal lesions on *post-mortem*. Perirectal oedema.

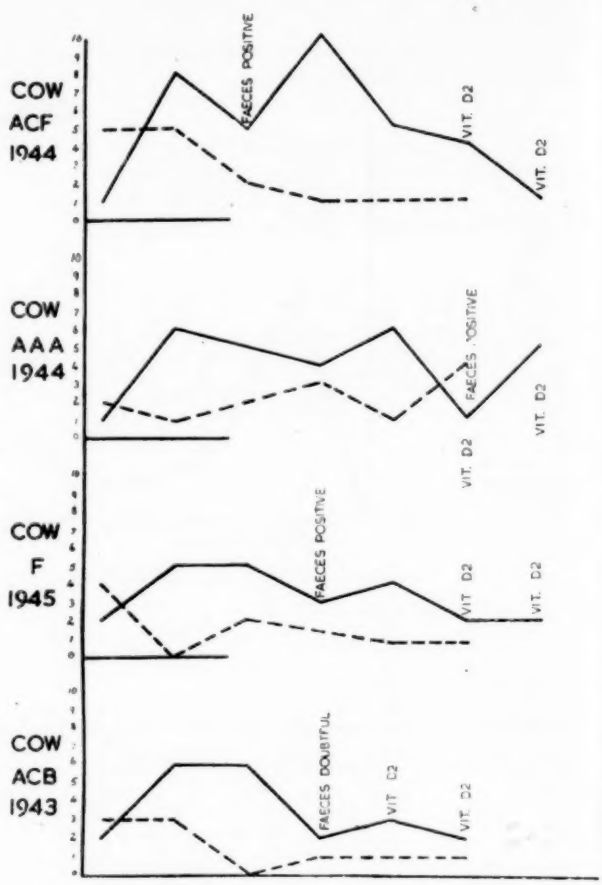


No. 5

Faeces always negative. Great difficulty in finding bacilli on *post-mortem*, but bacilli were later found in profusion in an area showing submucous haemorrhage.



No. 6



No. 7.—The above four cows are still alive and in excellent bodily condition at present.

All of the cows exhibiting these undulating descents have not, so far, developed clinical symptoms although they are known, from repeated examinations of the faeces, to be carrying the disease. (See graphs Nos. 6 and 7.) It thus appears that carriers either may exhibit a constant high reading or may carry on for an indefinite period with a low reading, which has fallen by steps, not by a rapid drop. Four of the graphs (Nos. shown in a group in graph No. 7) will illustrate this point. It is possibly mere coincidence that the four animals, the subjects of these graphs, have been injected on two occasions at intervals of a few months, with massive doses of vitamin D, with the object of maintaining the Ca/P ratio in the blood. It may be mentioned here that the limited number of blood samples examined have shown no significant mineral imbalance or deficiencies. The haemoglobin content also has been high even in cows showing intermaxillary oedema. The inference is that this symptom is not dependent upon anaemia.

A striking feature observed at the last six consecutive *post-mortem* examinations has been the presence of a marked oedema of the peri-rectal tissues and it has been possible in some cases to appreciate the thickening of these tissues when a hand has been introduced into the vagina

to palpate the space between the roof of the vagina and the lower wall of the rectum. On *post-mortem* examinations, in each case section revealed a marked thickening of the rectal wall for the last foot of its length with the presence of a layer of gelatinous material up to an inch in thickness, mainly confined to the lower wall and adjacent tissues. None of these six cases showed marked diarrhoea. This gelatinous layer has been observed only in cases examined immediately after slaughter. It is possible that it may liquefy or disappear in cases examined a number of hours after death. It will be noticed that the summary table includes the results of faeces examinations, some of which are classed (——?). This indicates that a number (ranging from a few to a great many) of *single* acid-fast bacilli, morphologically indistinguishable from Johne's bacilli, have been present in the films. Although it has been our practice to disregard such organisms in less than groups of three to five, it is still a matter of doubt whether Johne's bacilli, in normal circumstances, as yet perhaps not adopting the rôle of pathogens, may not occur frequently as single organisms. Much must depend upon the rate of multiplication of the bacilli within the intestinal villi. Although large numbers of Johne's bacilli may be present in the bowel without giving rise to any marked disturbance, it appears that circumstances may arise which result in a sudden rapid multiplication with the production of a local reaction, associated with small or diffuse submucous haemorrhages. Following these, sloughing of the superficial cell layers takes place, with discharge into the bowel lumen of groups of rapidly dividing bacilli. No doubt this occurs on many successive occasions in the same bowel. Occasionally, the factors which control multiplication of these organisms deteriorate suddenly, with the result that a very large area of the bowel wall exhibits an acute haemorrhagic enteritis. This is more commonly encountered in young cattle and in young cows introduced on to an infected farm. Death then results, within a few days, from acute enteritis and haemorrhagic diarrhoea. Usually the faeces contain innumerable clumps of acid-fasts, in contrast to the few found in less acute cases.

It would be useful if those observers who practise in areas where Johne's disease is believed not to exist—such as in N. Ireland—would record the nature of the bovine intestinal flora, noting the frequency or absence of single, acid-fast, Johne's-like bacilli. It may also be noted that in the herds dealt with in this investigation, scouring has not been a marked feature of the disease. In only two cases has it persisted over a considerable period. More often it has been moderate and intermittent in character, appearing only after marked wasting has occurred and the animal has been obviously approaching its end.

In conclusion, I would like to point out to any who may be interested in comparing tuberculin test charts with Johne's history that the readings are chiefly valuable when it is possible to continue them up to the time of illness or death. Owing to Ministry of Agriculture regulations, testing of attested herds is infrequent and a number of months may supervene between the last test made and the appearance of symptoms.

Acknowledgments.—I must express my indebtedness to Messrs. Boots, and particularly to Messrs. D. L. Hughes and E. J. H. Ford, for their laboratory assistance, to Dr. J. T. Edwards for much useful help and advice, also to the Crown Chemical Company for the supply of vitamins in massive dosage.

CLINICAL COMMUNICATION

TREATMENT OF FRACTURE OF OS CALCIS OF A BULL BY PLATING

HAMILTON KIRK, M.R.C.V.S., LONDON,

AND

CLEMENT FENNELL, M.R.C.V.S., ODIHAM

Subject.—A 13-month-old pedigree Guernsey bull.

History.—The bull was kept in one of the two bull pens, between which was a communicating door 4 feet high. In the other pen was an eight-year-old Guernsey bull. One morning the two bulls were found in one pen, the young one having jumped over the door.

When seen he was badly shocked; there was a swelling on the right chest wall over the last rib, and the right hock was very swollen, but there was no wound.

Diagnosis.—Although fracture was suspected, no definite diagnosis could be made, owing to the gross swelling of the joint. After a few days of poulticing to reduce swelling, X-ray examination revealed a transverse mid-shaft fracture of the os calcis.

Treatment.—It was decided to plate the fracture and then enclose the whole joint in a plaster cast. The bull was cast on the left side and anaesthetised with chloroform.

The whole of the hock was clipped, shaved and thoroughly cleansed with Cetavlon. An intramuscular injection of 2,000,000 units of penicillin in oil was given.

A skin incision about 5 inches long was made slightly lateral to the mid-line of the hock, down the length of the os calcis posteriorly, and the tissues dissected away until the bone was exposed.

Two 4-inch stainless steel plates were used for the operation, one being superimposed on the other for additional strength. The distal end of the plate was secured to the distal fragment of the fractured bone by 2 in. × 2½ in. stainless steel screws. The proximal end of the plate was then attached to the proximal portion of the bone by similar screws, thus drawing back the angulated portion of the bone into its original position from which it had been pulled forward by the gastrocnemius tendon.

The wound was packed with penicillin and sulphanilamide, and closed with interrupted silk sutures. The whole of the hock was then enclosed in a gypsona plaster cast.

After-treatment consisted of daily intramuscular injections of 2,000,000 units penicillin in oil for four days. Half an ounce of calcium and vitamin D (Willows & Co.) was given daily by mouth for a month.

The recovery of the animal's general condition was slow, the return of appetite to normal being long delayed. To expedite it, a course of 6 c.c. by 10 c.c. Acetylarsan (May & Baker) was given subcutaneously on alternate days. About three weeks after the operation the bull's appetite returned to normal and the general condition improved.

During this time the animal was kept well rugged up in a warm loose box, with peat moss litter for bedding.

After 28 days the plaster cast was removed and the wound found to have healed by first intention. The following day the bull was cast again, and under light chloroform anaesthesia the plates were removed.

Two months after the operation there was still a considerable swelling along the length of the os calcis, and a bursitis on the lateral aspect of the hock. The bull was not putting much weight on the limb. An X-ray taken at

this stage showed that the fracture had united.

Short-wave therapy by means of the inducto-therm unit was given for ten minutes three times a week, and following the first application there was a distinct improvement in the limb. Gentle exercise was commenced, and gradually more weight was borne. Improvement continued, and the bull was used for service 17 weeks after the operation. Since then he has served 15 heifers and two cows. Callus has caused a slight deformity of the hock, and slight lameness is still detectable. This, however, may clear up in course of time.

REVIEW

[Inventories of Apparatus and Materials for Teaching Science. Volume III.—Technical Colleges. Part I, Veterinary Sciences. Published by UNESCO, Paris. (Publication No. 568.) Price 7s.]

Despite six years of peace, there can be little doubt that one of the most clamant needs of war-ravaged Europe is both educational and cultural rehabilitation, and, in addition, the more backward peoples of the world, realising that their mastery of nature depends upon improved technology, will turn gladly to those contributions of UNESCO which are intended to point the way along the scientific path.

The publication under review is intended as a guide either to the rehabilitation or the establishment of a veterinary school, and as its model it has chosen the French National Veterinary School, whose curriculum is detailed. It covers a course of four years, and basically, the same subjects which we ourselves study in Great Britain, except that it is compressed into rather less time.

It is when one considers the recommended laboratory equipment that one is tempted to the view that here indeed is an *embarras de richesses*. For instance, the equipment recommended for the practical surgery classes includes, rather astonishingly, no less than three scialytic lamps at an estimated cost of 5,200 dollars, and many of the other recommendations follow the same lavish lines. It is hard to see how this extravagance on basic equipment can be justified in countries which are living upon American charity, but if used with reserve and discretion, there is no doubt that this report will go a long way to the successful establishment of veterinary schools in those parts of the world which have so far been without them.

whether his attention has been called to the difficulties experienced in transporting the racehorse Helioscope to South America, and to the injuries sustained by this animal while being forced into a plane; and whether he will give such instructions as will stop this unnecessary and unjustified suffering to a highly strung animal.

Mr. T. Williams: I understand from the Royal Society for Prevention of Cruelty to Animals, one of whose inspectors saw the horse shortly after the incident, that the animal appeared to be comfortable and showed no signs of injury. The Protection of Animals Act, 1911, makes it an offence to cause unnecessary suffering to an animal and I do not think that I am called upon to give any instructions in the matter.

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Dog Licences

Sir T. Moore (May 10th) asked the Financial Secretary to the Treasury whether he will consider making it obligatory that when the owner of a dog is making application for a renewal of his licence he must produce the dog with his name on the collar.

Mr. Jay: No.

ABSTRACT

[The Metabolism of Iron During Suckling. McCance, R. A., & Widdowson, E. M. (1951.) *J. Physiol.* **112.** 450–458.]

The total quantity of iron in the bodies of new-born mice, rats, kittens and piglets is found to increase greatly during the suckling period. In the case of the first three species the iron is probably derived from the mother's milk, but piglets must obtain most of it from their surroundings. Even in a concrete sty the amount of iron in the piglet's body increases considerably more than can be accounted for by the mother's milk. The liver of the new-born rabbit contains remarkably high amounts of iron (mean of 12 rabbits, averaging 55 g. bodyweight, 2·36 mg. inorganic Fe). Very little of this large "store" of iron, however, is withdrawn during suckling, and anaemia may occur. In the other species examined the total amount of iron in the liver at birth is quite a small fraction of the total body iron.

The bodies of most, if not all, species show some reduction in the percentage of iron towards the end of the suckling period, but this may not be enough to impair efficiency. The amount of reduction which an animal can stand without loss of efficiency probably varies from species to species. "The piglet may appear quite lively even when its haemoglobin is very low, but it soon shows a loss of efficiency. This animal, however, has no surplus of iron in its body at birth. In fact, a comparison of the percentage of iron in the bodies of new-born and adult pigs suggests that even at birth the percentage of iron in the body may be sub-optimal."

A. N. W.

QUESTIONS IN PARLIAMENT

Newcastle Disease in the Gambia : Abandonment of Poultry Rearing

Prior to the rising of the House of Commons for the Whitsuntide Recess, Mr. Dugdale, Minister of State for Colonial Affairs, announced in reply to Mr. Hurd, who asked if a decision had been reached on the Colonial Development Corporation's poultry project in the Gambia, that the Corporation had decided to abandon that project, chiefly because of an outbreak of Newcastle disease.

The Minister said (May 9th): On the basis of the Mission's Report, the Board concluded that the chances of ultimate success of the original project to produce poultry and eggs were slender; it might have been possible to proceed with a modified project for a few years, severely limited in scope and expenditure, to determine the possibilities of reviving poultry rearing after some years at a profitable level, but unfortunately, since the Mission reported, there has been an outbreak of Newcastle disease among the poultry, and this coming on top of the other considerations has led the Corporation to decide that all further efforts to rear poultry in the Gambia must finally be abandoned.

There will remain a considerable area of cleared land on which agricultural development of value to the restricted economy of the Gambia may be possible. To examine this possibility, the Corporation are setting up an Agricultural Working Party on which my right hon. Friend [Secretary of State for the Colonies] has agreed to appoint representatives. The Working Party hopes to begin its meetings in London next week.

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Horses (Slaughter)

Sir T. Moore (May 10th) asked the Minister of Agriculture if he will introduce legislation to prohibit the slaughter of horses for human consumption in this country.

Mr. T. Williams: No.

. . . . .

Racehorse (Transport to U.S.)

Sir T. Moore (May 10th) asked the Minister of Agriculture

(Concluded at foot of previous column)

Brigadier Heveningham Visits Hong Kong

Members of the veterinary profession in Hong Kong were privileged on the night of April 9th to entertain at a dinner in the Hong Kong Club Brigadier A. G. Heveningham and Lt.-Col. P. A. Reeves.

After toasts of His Majesty the King and the Veterinary Profession were honoured, Lt.-Col. Reeves proposed the toast of the Dublin Veterinary College, indicating that this College although one of the younger colleges justifiably regarded itself as being second to none.

Mr. R. H. Robertson, in giving the toast of the Royal (Dick) Veterinary College, referred to the presence at this gathering of no less than five members of the "Dick" Alumnus Association. This was proved later to be not quite the truth, the Brigadier at present being in arrears with his subscription!

In the absence of a representative of Glasgow Veterinary College, Mr. J. A. Auchnie graciously consented to propose the toast of this College, and in fact this toast was the only one accorded musical honours, each individual present simultaneously recollecting that he belonged to Glasgow.

Captain C. N. Chappel then toasted Liverpool Veterinary College, enumerating in his remarks several other distinguished gentlemen who had qualified there.

The toast of the Royal Veterinary College was proposed by Lt.-Col. J. C. Rix, whose speech was interlarded with anecdotes bearing a distinct veterinary flavour.

Captain G. H. Dick, toasting the Royal Army Veterinary Corps, indicated, with all due respect to the Brigadier, that Ireland and Scotland at the present time supplied the backbone of the Corps.

In proposing the health of the Guests, Mr. H. C. Watson welcomed this, his first, opportunity of resuming his friendship with the Brigadier during the latter's 25 years' march from Officer-Cadet Sergeant Major to Brigadier.

Brigadier Heveningham, in reply, expressed himself as being profoundly impressed with the happy atmosphere he found prevailing among the veterinary surgeons of Hong Kong.

A most enjoyable evening terminated with a brief visit to a very respectable Night Club.

The Cock Robin Baton

There being a preponderance of "Dick" Alumni present, the indulgence of the other gentlemen was craved during the performance of the traditional Cock Robin Ceremony. Brigadier Heveningham, who, in the much regretted absence of Principal Mitchell, by unanimous consent was appointed principal actor, at once gracefully relegated this happy task to Mr. R. H. Robertson, who, a suitable Baton having been procured, rendered "Cock Robin" with considerable gusto.

The Baton, suitably inscribed, will be presented by the Brigadier (along with his subscription) on his return to the United Kingdom to the President of the Royal (Dick) Veterinary College Alumnus Association.

H. C. W.

Left to Right:—R. H. Robertson, P. A. Reeves, J. A. Auchnie, A. G. Heveningham, H. C. Watson, G. H. Dick, J. C. Rix, C. N. Chappel.

NOTES AND NEWS

Diary of Events

May 19th.—Annual General Meeting of the Society of Women Veterinary Surgeons at the Royal Veterinary College, Camden Town, 2 p.m.

May 23rd.—Meeting of the Technical Development Committee, N.V.M.A., at 36, Gordon Square, London, W.C.1, 10.30 a.m.

May 24th.—Annual General Meeting of the East Midlands Division, N.V.M.A., at Sutton Bonington, 2.15 p.m.

May 24th.—Meeting of the South-Eastern Division, N.V.M.A., at Tunbridge Wells (Mount Ephraim Hotel), 2.30 p.m.

May 24th.—Annual General Meeting of the Ayrshire Division, N.V.M.A., at Ayr (Hotel Dalblair), 2.30 p.m.

May 25th.—Annual General Meeting of the Society of Practising Veterinary Surgeons, at York (Royal Station Hotel), 2.30 p.m.

May 25th.—Meeting of the Royal Counties Division, N.V.M.A., at Reading (Caversham Bridge Hotel), 2.30 p.m.

May 30th.—Annual General Meeting of the West of Scotland Division, N.V.M.A., at Glasgow (North British Station Hotel), 2.30 p.m.

June 1st.—Meeting of the South Wales Division, N.V.M.A., at Llandilo (Cawdor Arms Hotel), 2.15 p.m.

June 5th.—Fifth in the series of Almroth Wright Lectures. The Wright-Fleming Institute of Microbiology, St. Mary's Hospital Medical School, London, W.2: R. Lovell, D.Sc., M.R.C.V.S. (Royal Veterinary College), "Infection and Resistance in Young Animals," 5 p.m.

June 6th.—108th Annual General Meeting of the Royal College of Veterinary Surgeons at 10, Red Lion Square, London, W.C.1, 12 noon.

June 6th.—Annual General Meeting of the Victoria Veterinary Benevolent Fund, at 10, Red Lion Square, London, W.C.1—immediately following the above.

June 6th, 7th and 8th.—Meetings of Committees and Council, R.C.V.S., at 10, Red Lion Square, London, W.C.1.

Sept. 23rd-29th.—Sixty-ninth Annual General Meeting and Congress of the National Veterinary Medical Association, at Eastbourne.

N.V.M.A. Meetings in Edinburgh

Wednesday, July 11th:
11 a.m. Home Appointments Committee.
2 p.m Organising Committee.
4 p.m. Parliamentary and Public Relations Committee.

Thursday, July 12th:
11 a.m. Veterinary State Medicine Committee.
2 p.m. General Purposes and Finance Committee.

Friday, July 13th:
11 a.m. Council.

R.C.V.S. Examinations

Thursday, June 7th.—D.V.S.M. Written Examinations commence at Edinburgh.
Monday, June 11th.—D.V.S.M. Oral Examinations commence.
Thursday, June 21st.—M.R.C.V.S. Written Examinations.
Friday, June 22nd.—M.R.C.V.S. Written Examinations.

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PERSONAL

Appointments.—Mr. James Smith, M.R.C.V.S., Veterinary Officer of the Milk Marketing Board Cattle Breeding Centre at Carmarthen since its inception nearly two years ago, has been appointed to a similar post at the Board's new cattle breeding centre at Writtle, Chelmsford. He has been succeeded at Carmarthen by Mr. G. Williams, B.Sc., M.R.C.V.S., formerly Assistant Veterinary Officer at Beccles, Suffolk.

On his departure Mr. Smith was presented with a Westminster chiming clock, suitably inscribed, by the staff of the main and sub-centres of the M.M.B. Cattle Breeding Centre, Carmarthen, as a mark of their high respect for him.

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Birth.—Blanchard.—On May 7th, 1951, at Somerville Nursing Home, Hereford, to Mary Margaret and John H. Blanchard, Leominster, Herefordshire, a daughter.

DARBYSHIRE.—On May 1st, 1951, at Lady Kennedy Nursing Home, Umtali, Southern Rhodesia, to Molly Spencer (*née* Small), wife of James Humphrey Darbyshire, B.SC. (LOND.), M.R.C.V.S., a daughter, Sharon Spencer.

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Marriage.—ALLEN—HUMPHRIES.—On May 5th, 1951, at Bluestone Methodist Church, Lurgan, by Rev. F. M'Ivor—Thomas Henry Allen, M.R.C.V.S., youngest son of Mr. James Allen, J.P., and Mrs. Allen, 31, High Street, Lurgan, to Mary Eileen, eldest daughter of the late John A. Humphries and of Mrs. Humphries, Westfield House, Lurgan.

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R.C.V.S. OBITUARY

MACDONALD, James Frank, Capt. late R.A.V.C., of "Brunstane," Three Elm Lane, Tonbridge, Kent. Graduated Edinburgh, May 22nd, 1907. Died May 9th, 1951.

O'LEARY, Thomas, New Street, Macroom, Co. Cork, Eire. Graduated Dublin, July 22nd, 1912. Died May 3rd, 1951.

Captain James Frank Macdonald, M.R.C.V.S.

James Frank Macdonald, whose death we deeply regret to record above, was educated at Watson's College, Edinburgh, and carried out his veterinary studies at the Royal (Dick) Veterinary College. He came to London as assistant to the late Mr. Cockerton in the East End of London, mainly among heavy draught horses. On the outbreak of war in 1914 he obtained a commission in the (R.)A.V.C. and served throughout, subsequently obtaining a post with the Hay's Wharf Cartage Co. as veterinary surgeon assistant to the late Mr. J. W. McIntosh, M.R.C.V.S., with whom he formed a very close friendship. On the great reduction of the use of horses for transport in London his employment was terminated and he went into partnership in general practice with Captain T. L. Wright at Putney, where he readily adapted himself to the very different type of practice mainly among polo ponies and small animals. In 1926 he married Mrs. J. Shotton, widow of Captain W. Shotton and daughter of the late Mr. Warren, M.R.C.V.S., of Tonbridge.

In 1936 he retired from partnership with Captain Wright with the intention of leading a quiet life in the country with a small practice more or less as a pastime, and with this end in view had a house built at Hadlow, near Tonbridge. However, the advent of war made heavy calls on all veterinary surgeons in the country, and the practice grew rapidly. He wrote on one occasion that it had become a Frankenstein and had grown far bigger than he ever intended. During his residence in London, he was for many years the very capable Hon. Secretary of the Central Veterinary Society and was awarded the Victory Medal and elected President of that Society in 1935. Of a quiet and rather restrained disposition, nevertheless Captain Macdonald was very popular and greatly respected.

He had been handicapped by ill health during the last three or four years of his life, but kept on stoically and with great fortitude. He leaves a widow and a married step-daughter, to whom we extend our sincere sympathy.

MR. THOMAS O'LEARY, M.R.C.V.S.

Mr. Thomas O'Leary, whose death we record above with much regret, was a member of the veterinary staff of the Health Section of the Cork County Council, having served in the Macroom rural area for about 48 years as Veterinary Inspector.

He was Chairman of the Macroom Agricultural Show Society, the founding of which was in a large measure due to his enthusiasm.

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GENERAL OBITUARY

Mr. A. S. Le Souef

Albert Shitbourne Le Souef, G.M.V.C., C.M.Z.S., to whose death reference was made in our issue of April 14th, died on March 31st, 1951.

A. S. Le Souef was born in Melbourne on January 20th, 1877, and was educated at Carlton College, Melbourne, and at the Melbourne Veterinary College, which was a private institution conducted by W. T. Kendall, M.R.C.V.S., from which he graduated in 1895.

He served as Assistant Director of the Zoological Gardens in Melbourne from 1896 to 1903, and was appointed as the first Director of the Zoological Gardens, Sydney, in 1903. He remained in this position after the institution was transferred to Taronga Park, and until he retired in 1936.

He was a foundation member of the Royal Australasian Ornithologists Union, and was a Councillor of the Royal Zoological Society, N.S.W., of which he was a former President. He was also a corresponding member of the Zoological Society, London. He had an abiding interest in wild life in Australia. He was the principal author, with Harry J. Birrell and E. Troughton, of *The Wild Animals of Australasia*, 1926. He also contributed many articles to Australian and overseas journals on zoology.

Not only was Le Souef interested and active in the conservation of the wild animals of Australia, but he also interested himself in the psychological reactions of animals to change in their environment. There can be little doubt that his veterinary training was of great help to him in his work and helped him to reach eminence in the field of zoology and natural history.

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ROYAL COLLEGE OF VETERINARY SURGEONS

Animal Management Examination

LIST OF SUCCESSFUL CANDIDATES

London

Alexander, T. J. L.
Ansell, R. H.
Arnold, J. H. S.
Barton, C. R. Q.
Beaumont, S. H.
Beddows, A. C. L.
Beesley, C. J. (Credit)
Booker, J. C.
Brazier, J. F. H. (Credit)
Brocklesby, D. W.
Buxton, Peter
Cansfield, C. J.
Cawthorne, W. N. (Credit)
Cullen, C. S.
Davidson, H. M. (Credit)
Davies, M. G.
Dubery, B. R. E.
Gibson, F. E. T. (Credit)
Hammond, Miss W. M. (Credit)
Hampshire, F. J. W.
Hardwick, A. G
Holmes, J. R.
Holmes, R. G. (Credit)
Jones, R. H. (Credit)
Jones, T. H.
Kearns, M. P.
Keeling, M. D.
King, D. K.
Knight, S. A.
Loving, Charles
McVey, K. I.
Maynard, H. M. F.
Mears, R. H.
Nelson, G. J.
Olorenshaw, P. H. (Credit)
Pigott, R. C. C.
Roberts, D. H.
Russell, G. H.
Skone, J. B.
Smith, Miss L. C.
Stalbow, Michael
Thursby-Pelham, R. H. C.
Vinsen, M. A.
Vinycomb, Miss H. M. (Credit)
Waller, J. F.
Walter, A. J.

(To be continued)

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SOCIETY FOR THE STUDY OF FERTILITY

This Society, which has been developed from the Family Planning Association, was formed to provide a means of discussion of problems of interest with regard to fertility for all workers in the medical, veterinary and zoological fields. A conference is to be held annually at which papers recording experimental, investigational and clinical work will be read and discussed. The proceedings will be published. Dr. A. S. Parkes is Chairman of the Society and the Joint Hon. Secretaries are Dr. G. I. M. Swyer, of University College Hospital, and Dr. A. Walton, of the A.R.C. Unit of Animal Reproduction, Cambridge.

The proceedings of the 1949 Conference on Infertility of the Family Planning Association which are published uniformly with those of the new Society are of interest to members of the veterinary profession. Papers on all aspects of both male and female fertility are included. Most are concerned with human problems, but all have a bearing on infertility generally.

The next annual conference of the Society for the Study of Fertility will be held at Girton College, Cambridge, on June 20th and 21st, 1951.

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ANIMAL REPRODUCTION: CONGRESS AT COPENHAGEN IN 1952

The International Standing Committee, appointed at the Milan Congress in 1948, having examined the possibilities for holding the next Congress, it has been agreed that the Second International Congress of Physiology and Pathology of Animal Reproduction and of Artificial Insemination will be held in Copenhagen, Denmark, from July 7th to 10th, 1952, with the following programme:

(1) The physiology of reproduction.
(2) The pathology of reproduction
(3) Artificial Insemination (A.I.) of domestic animals.

The Standing Committee has nominated Dr. John Hammond, School of Agriculture, Cambridge, as President, Professor Nils Lagerlof, Stockholm, as Vice-President, and Professor Ed Sorensen, Copenhagen, as Secretary-General.

The Congress is sponsored by the Danish Ministry of Agriculture and will be organised by the Royal Veterinary and Agriculture College, Copenhagen, the Danish Federation of Cattle Breeding Societies for A.I., and the Society of Danish Veterinary Surgeons.

A more detailed provisional programme will be issued as soon as possible. All particulars are obtainable from the Secretary-General, Professor Ed Sorensen, The Royal Veterinary and Agricultural College, Bulowsvej 13, Copenhagen, V. Denmark.

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VETERINARY SERVICES IN THE WESTERN ISLES

The *Glasgow Herald* reports that, following a refusal by the Department of Agriculture for Scotland to appoint a veterinary surgeon for Harris and the southern part of Lewis, Harris District Council have agreed at a meeting in Tarbert to press their claim, and to appeal to the Secretary of State for Scotland and the M.P. for the Western Isles if it is not granted. It was stated that Lewis and Harris, with a population of more than 30,000, are served by one veterinary surgeon at Stornoway. Councillor Alexander Morrison said that there were three veterinary surgeons in Skye, which had a population of only 10,000.

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Tuberculosis (Attested Herds) Scheme

STATEMENT SHOWING POSITION IN EACH COUNTY AS AT MARCH 31ST, 1951

County	Total Cattle as at 3.6.50	Number of Attested Herds as at 31.3.51	Number of Cattle in Attested Herds as at 31.3.51*	Percentage of Attested Cattle to Total Cattle
Bedford	49,480	150	9,030	18·2
Berkshire	88,659	636	38,320	43·2
Buckingham	119,332	497	27,900	23·4
Cambridge	34,692	125	7,890	22·8
Isle of Ely	23,705	33	1,750	7·4
Chester	254,738	971	48,410	19·0
Cornwall	289,851	774	28,080	9·7
†Isles of Scilly	481	89	*1,200	100·0
Cumberland	228,610	2,207	106,200	46·5
Derby	194,059	488	26,250	13·5
Devon	432,429	1,134	50,550	11·7
Dorset	156,148	941	57,940	37·1
Durham	119,242	751	28,500	23·9
Essex	130,089	673	37,800	29·1
Gloucester	203,974	848	48,960	24·0
Hampshire	154,061	1,067	57,980	37·6
Isle of Wight	21,346	176	8,010	37·5
Hereford	146,823	469	23,200	15·8
Hertford	63,378	352	21,310	33·7
Huntingdon	30,686	47	2,900	9·5
Kent	126,063	604	32,070	25·4
Lancaster	286,944	1,392	57,710	20·1
Leicester	176,404	316	18,440	10·3
Lincoln (Holland)	29,759	11	330	1·1
" (Kesteven)	73,926	108	5,460	7·4
" (Lindsey)	170,480	165	8,250	4·8
London	—	—	—	—
Middlesex	8,216	30	2,300	27·9
Norfolk	198,792	553	41,700	21·0
Northampton	160,712	208	14,020	8·3
Soke of Peterborough	7,295			
Northumberland	203,001	419	24,970	12·3
Nottingham	115,405	223	11,200	9·8
Oxford	112,623	676	38,740	34·4
Rutland	20,991	14	500	2·4
Salop	288,516	794	48,780	17·1
Somerset	337,676	1,435	79,040	23·7
Stafford	245,760	472	24,620	10·0
Suffolk, East	86,578	315	16,710	19·3
" West	42,569	195	13,620	32·0
Surrey	54,583	508	23,200	42·5
Sussex, East	111,901	599	27,170	24·3
" West	78,202	460	26,050	33·3
Warwick	158,264	443	24,790	15·7
Westmorland	98,326	1,673	71,690	72·9
Wiltshire	205,118	757	58,590	28·5
Worcester	107,782	296	15,620	14·5
York, E. Riding	144,568	133	6,040	4·4
" N. Riding	258,275	1,119	41,670	16·1
" W. Riding	352,538	1,759	65,280	18·5
ENGLAND	7,003,149	28,123	1,431,910	20·4
WALES	1,011,218	16,467	380,200	37·6
ENGLAND & WALES	8,014,367	44,590	1,812,110	22·6
SCOTLAND				
Aberdeen	235,580	277	24,310	10·3
Angus	69,700	144	14,190	20·3
Argyll	63,503	762	26,270	41·4
Ayr	153,805	2,247	138,320	89·9
Banff	57,370	66	4,970	8·7
Berwick	35,160	84	5,720	16·3
Bute: Non-attested area	5,200	85	4,360	83·8
" Attested area	5,535	236	5,540	100·0
Caithness	27,446	158	4,160	15·2
Clackmannan	4,733	34	2,300	48·7
Dumfries	105,272	1,577	85,760	81·5
Dunbarton	17,256	258	13,500	78·2
East Lothian	16,254	59	4,490	27·6
Fife	65,635	413	27,030	41·2
Inverness	52,447	89	4,780	9·1
Kincardine	40,925	78	6,080	14·8
Kinross	9,815	48	3,970	40·4
Kirkcudbright	75,899	937	60,430	79·6
Lanark	94,268	1,444	76,880	81·6
Midlothian	24,736	283	12,430	50·3
Moray	30,516	63	4,860	15·9
Nairn	8,804	24	1,820	20·7
Orkney	48,594	171	5,200	10·7
Peebles	11,632	191	7,830	67·3
Perth	95,638	333	20,740	21·7
Renfrew	30,217	462	23,620	78·2
Ross-shire	40,213	180	4,150	10·3
Roxburgh	35,541	87	5,790	16·3
Selkirk	6,060	69	2,000	33·0
Stirling	41,621	457	23,080	55·5
Sutherland	10,184	105	1,260	12·4
West Lothian	15,317	171	8,490	55·5
Wigtown	74,297	696	56,860	76·5
†Zetland: Attested area	7,208	1,897	*7,210	100·0
SCOTLAND	1,616,390	14,135	698,400	43·2
GREAT BRITAIN	9,630,757	58,725	2,510,510	26·1

* These figures show an appreciable increase over the corresponding figures in the statement for December 31st, 1950. These were known to have been on the low side. A fresh count has been made for the purpose of the present statement. This should be borne in mind when comparing the number of attested cattle in the two statements.

† All cattle herds in Zetland and Isles of Scilly are attested. This figure represents the number of animals at the last test of the herds.

* * * * *

NATIONAL COLLEGE OF FOOD TECHNOLOGY

The Governors of the National College of Food Technology have appointed as Principal of the College Dr. J. D. Mounfield, head of the research department of the British Arkady Co., Ltd., Manchester. Dr. Mounfield graduated as Bachelor of Technical Science, University of Manchester, 1921, and was awarded the degree of Master of Technical Science in 1923, and degree of Ph.D., in 1936. He lectured for some time on foodstuffs in the Faculty of Technology, Manchester University, and thereafter was employed by the British Flour Millers Research Association. During the last war he carried out investigations for the Ministry of Food at the Cereal Research Station into the drying and storage of grain.

* * * * *

SHORTAGE OF BLACKSMITHS

At a meeting of the Worcester Branch of the National Master Farriers' and Blacksmiths' and Agricultural Engineers' Association held under the Chairmanship of Mr. J. C. Currie, M.R.C.V.S., several members present expressed the opinion that falling of recruitment to the trade was due largely to lack of appreciation among younger people of the high degree of skill and knowledge required to be an efficient farrier and agricultural blacksmith. Members requested that the whole question of recruitment of apprentices to the trade should be fully discussed at the next meeting, as there are some 60 to 70 blacksmiths' shops in Worcestershire. The closing of even a small percentage of these remaining shops would seriously affect the ability of the trade to satisfy the demand of farmers and horse owners both from the point of shoeing and general smithing and repair work.

Professional Ethics and Advertising (1817)

The following advertisement is taken from "Canine Pathology" by Delabere Blaine, published by Boosey in 1817, and in these days of strict professional discipline is an interesting reflection on accepted standards of ethical conduct at that time:

Mr. YOUATT

Veterinary Surgeon

(Late Blaine & Youatt)

3, Nassau Street, Middlesex Hospital,

respectfully informs the Public and Sportsmen in particular, that he gives his advice on the DISEASES OF HORSES and DOGS and practices the VETERINARY ART in all its Branches.

While he solicits a continuance of that distinguished patronage with which his late Partner was favoured during twenty years, and with which himself has been hitherto honoured, he begs leave diffidently to state, that, in addition to a regular attendance on the instructions of the able Professor of the Veterinary College, and on the medical and anatomical lectures of the most eminent practitioners of human medicine and surgery, he has enjoyed the advantage of being connected with Mr. Blaine during four years; in which time he had full opportunity of becoming acquainted with the peculiar and unrivalled mode of practice of that excellent Veterinarian. To this he will add, that, so far as diligence and undivided attention to the duties of his profession will avail, he trusts that he shall deserve that patronage.

Mr. Y. has every convenience for the reception of SICK HORSES, and for Blistering, Physicking, getting them into Condition, or otherwise attending to them as the case may require; and a commodious and complete HOSPITAL FOR DOGS.

The charge for Horses is regulated by circumstances, but will always be found extremely moderate.

The charge for Dogs received into the Hospital varies from 5s. to 10s. 6d. per week, according to the size of the animal, the nature of the disorder, or the trouble which it gives.

His fee for consultation at home, on the diseases of animals, is from 5s. to 7s. 6d. for each horse and from 3s. 6d. to 5s. for each dog, including medicines; but after the first consultation the medicines only will be charged. For consultation by letter, his fee is 7s. for the first letter and 5s. for each succeeding one. Should he be required to attend abroad, he charges 5s. for a single visit, if within two miles of his residence, and 3s. 6d. per visit when more than one are required.

Mr. Youatt's charge for a visit, at any distance between two and four miles is 7s.; between four and five miles 10s. 6d.; between five and eight miles, one guinea; and, for a journey to any greater distance, two guineas per day and his travelling expenses.

He deems this mode of charging the most respectable; and, as he is relieved by it from the necessity of forcing upon his patients treble the quantity of medicine which is really necessary, it will be found that his whole charge will never exceed, and very rarely equal, that of a common farrier.

Mr. Y's certain Hours of Attendance at Home, unless some extremely urgent occurrence calls him abroad, are from 9 to 11 in the morning, and from 2 to 4 in the afternoon. At other hours he will always be at the service of his friends, when not engaged in visiting his patients abroad.

Although Mr. Y. has declined the establishment of a Forge, he superintends the Shoeing of Horses, either at the Farrier's whom he employs, or elsewhere; and he has a variety of Pattern Shoes on an improved principle, to enable Gentlemen to give proper directions to their farriers in the country.

* * * * *

ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are **situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.**

SWINE FEVER:

*Flint*s.—Chester Street, Mold, Flints (May 10th).

Norfolk.—Fairlawn Gardens, King's Lynn (May 9th).

Shropshire.—"Middledale," Greete, Nr. Ludlow (May 7th).

Renfrewshire.—16, Dorian Avenue, Giffnock, Glasgow (May 9th).

Yorks (E.R.).—Askholme Hill Nurseries, Hedon, Hull (May 10th).

Yorks (N.R.).—Bleeder Beck, Ravenscar, Scarborough, Yorks (May 8th); Coldyhill Lane, Newby, Scarborough (May 10th).

Yorks (W.R.).—144, Flanshaw Lane, Wakefield (May 7th); Fryston Allotments, Fryston, Castleford, Yorks (May 9th); 77, Watergate, Methley, Leeds (May 10th).

LONDON CART HORSE PARADE

It says much for the popularity of the annual show of the London Cart Horse Parade Society that despite the new festival counter-attractions, there was an apparently undiminished crowd of sight-seers in Regent's Park on Whit Monday to witness the 55th annual show and parade in the inner circle of the park. Shires, Clydesdales, and Suffolks were there in single and double harness—their manes and tails braided in bright colours—drawing a variety of wagons and vans, in which the drivers were joined by their families and friends.

In the last year before the war there were 500 horses on parade. That number has gradually dwindled until this year's total of 176 is 23 fewer than last year's, but against that is to be set the fact that last Whitsun British Railways entered 61 and this time only 14. There were, therefore, 24 more horses from other exhibitors.

Mr. H. T. L. Young, the President of the Society, was pleased with the condition of the entries. Their care, he asserted, was as good as, if not better than, it had ever been, and he had a particular word of praise for the excellent shoeing.

* * * * *

AT THE FILMS: "THE FARMER'S HORSE"

The public has come to treat the Central Office of Information Films with a certain amount of reserve for seldom are they free from the taint of propaganda. In "The Farmer's Horse," however, the propaganda will be generally welcomed, for the entire film is a plea for the retention of the horse on the farm. It is not to be regarded as a debate on horse versus tractor, but it is a very definite attempt to prove that there still is a place for the horse on the average farm.

Helen de Mouilpied has tackled this difficult subject with intelligence and percipience in presenting in an all too short 18 minutes, the part that the horse can still play on the British farm, and leaves it to the audience to decide for themselves the usefulness of the horse on any particular farm, a point which is emphasised in the final words of the commentator, L. F. Easterbrook, "that's something that you and every farmer can only decide for yourselves. We know horses are useful. The thing is, how do they fit in on your farm?"

The film fails, however, in the dialogue, which is stilted, dreary and utterly unconvincing. More vigorous direction would have changed this film from just another government hand-out to a small masterpiece of real value to the public.

* * * * *

Edinburgh University are offering a new degree of Bachelor of Science in Agriculture. The curriculum will start in October this year. The course will take four years for an ordinary and five for an honours degree.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the N.V.M.A.

"ANAVENOL"—CARDIOLOGICAL ASPECTS, AND THE CONCEPT OF FUNCTIONAL RESERVE OF THE CARDIOVASCULAR SYSTEM

Sir,—Messrs. Gold and Longley are perfectly correct when, in their letter in your issue of April 21st, they draw attention to the unusual interest attaching to the pharmacological action of "Anavenol" on the cardiovascular system of the horse. This has been realised since our early studies of the drug, and as a result we have investigated the action of "Anavenol" on horses with various cardiovascular disorders as well as on normal animals. It was upon the results of these studies that the paper published a year ago (*Vet. Rec.* **62**, 500) was based, but it was not possible in that paper to discuss in detail the experimental work. To draw the attention of practitioners to the cardiovascular effects of "Anavenol," which—on the basis of my own series of some 300 anaesthesias—appeared to me to be the toxic hazard most likely to be encountered in practice, I purposely stressed this effect so that anyone using "Anavenol" would be forewarned and on their guard. It would appear from Messrs. Gold and Longley's letter, and particularly from their rather unfortunate use of quotations

taken from their proper context, that I may have over-stressed this particular hazard with "Anavenol."

In a letter it is quite impossible to deal in detail with all the problems of physiological medicine which are raised by Messrs. Gold and Longley. I shall have to restrict my comments to a few salient points. I would point out that my remarks on the cardiovascular system of the horse were and are based on the usually accepted physiological concepts regarding the haemodynamics of the circulation; these concepts have been derived largely from experimental work on the dog, and since no studies on the horse are available, the results obtained on the dog have had to be transferred *pari passu* to the horse. We have been able to check in a small way that the assumptions inherent in such species transference are, in the main, valid by direct studies of blood pressure and electrocardiograms in a small series of horses, the data from which has served to supplement our detailed clinical observations. In addition, a number of animals with known cardiovascular defects, such as valvular incompetence and myocardial weakness, have been used in special toxicity trials for the evaluation of the cardiovascular hazard.

Thus, my original paper was not based solely on a normal sample of healthy horses, but included a series of known "cardiopathic" cases, and it is quite incorrect to infer therefrom, as Messrs. Gold and Longley would do, that I consider "cardiopathic" conditions in the horse to be common. In point of fact, there is extraordinarily little reliable clinical or laboratory evidence of recent date upon which to form an opinion on the nature and incidence of "cardiopathic" disease in the horse. It is only too apparent, if one attempts to investigate this problem with a realisation of the underlying pathological physiology, that the usual clinical examination for soundness is insufficient to allow any accurate assessment of the horse's cardiovascular system, unless such animals are subjected, in addition, to careful physiological measurements.

Messrs. Gold and Longley quite rightly point out that organic disease of the heart, *as revealed by the usual techniques*, is very rare in the horse, but that is not to say that *deficits of normal physiological functional reserve* are not quite common.

The ability of the horse's heart and cardiovascular system to withstand unusual demands, be they physical exertion or the effect of drugs, depends in the main on what we may term the functional reserve of the cardiovascular system, or in brief, the cardiovascular reserve. The concept of the functional reserve of an organ system is a most useful one in physiological medicine, as it allows one to attempt a rough quantitative assessment of the ability of an organ system to withstand stresses before functional insufficiency will develop. Functional insufficiency is usually accompanied by clinical signs of ill-health, in the case of the heart of circulatory failure in one of its forms (decompensated cardiac disease). The cardiovascular reserve, as determined clinically, depends principally on the assessment of five main features—the heart frequency and its changes with exercise, heart size, the state of the myocardium, the resistance against which the heart has to work and its ability to pump the blood returning to the heart. Thus a moderate sized heart with a slow frequency at rest, no valvular lesions and a healthy myocardium is likely to have a better functional reserve than a large heart with a more frequent resting frequency and valvular lesions. The accurate assessment of this reserve is the true measure of a clinician's skill.

This concept is the crux of the disagreement expressed by Messrs. Gold and Longley in their letter obscured though it is by their somewhat retrograde allusions to mediaeval legal practices and the occult. They have misread my paper because apparently they have failed to realise that reduction of the functional reserve of the cardiovascular system can and does occur without obvious morphological abnormality, so-called organic disease, and that reduction of functional reserve may or may not lead to clinical signs of circulatory failure depending on the demands being made on the system at the time. As to the meaning of the terms "cardiac decompensation" and "compensated heart disease" the cardiac disease is termed *decompensated* when signs of circulatory failure occur; in fact, cardiac disease is invariably *compensated* in its early stages because the additional load placed on the heart does not usually exceed the normal functional reserve and it is only when the cardiac disease is so severe that this functional reserve is no longer able to meet the increased demands that decompensation occurs and clinical signs of cardiovascular disease appear. Even so, the phases of decompensation at first are usually short and will occur only under periods of unusual stress such as severe physical exertion, and, provided the patient is not subjected to unusual stress, no signs of cardiovascular insufficiency need occur. Thus the tachycardia which may follow the administration of "Anavenol," particularly in older horses or if the injection has been rapid, reduces the cardiac reserve. This is usually of no consequence at all in animals with a normal cardiac reserve—*i.e.*, young, healthy horses, without any evidence of cardiovascular disease—because the cardiovascular system is able to adjust perfectly well to the transient mechanical disadvantage under which it must operate during the tachycardia. In practice, if an animal is not able to withstand this tachycardia—say a heart frequency of 120 to 140 per minute—and the tachycardia does not disappear when the injection is stopped for a short while, then there are strong *a priori* grounds for suspecting some myocardial weakness, even if this was not suspected previously. These signs of tachycardia, with or without a positive cardiac jugular pulse, are described in my paper. If Messrs. Gold and Longley will consult it they will find that no mention is made of ventricular fibrillation as being a sign; it is a cardiovascular disease the signs of which are those of peracute left- and right-sided circulatory failure. From acute toxicity trials we know that ventricular fibrillation can be induced with "Anavenol" but the dose and rate of administration are far beyond the normal therapeutic limits and with proper administration of the drug and assessment of the patient it is a most unlikely sequel.

The interpretation that the transient tricuspid regurgitation which has been observed is due to relaxation of the musculature of the right atrio-ventricular valve is based on the observation that the right-sided systolic bruit, audible over the base of the heart and which is not audible on the left side, coincides precisely in time with the jugular pulse wave and yet no organic disorder of the atrio-ventricular orifice can be detected at autopsy. Such transient murmurs are of course common in both normal horses and dogs at rest and have, I suspect, in the past given rise to many mistaken diagnoses. Temporary dilatation of the atrio-ventricular ring was recognised in human medicine by Steel of Manchester in the 1880s as being of limited pathological significance if there was no evidence of other pathological abnormalities of the cardiovascular system. That this concept has not been widely recognised in veterinary medicine is I feel no reason why it should not be used, provided the critical diagnostic criteria apply, as indeed they do.

Whether or not cardiovascular toxicity is a serious disqualification of any anaesthetic is of course a matter of degree. I would merely quote the well known effects of chloroform and cyclopropane on cardiac rhythm, which under certain circumstances can be very serious. However, full assessment of the quantitative significance of these disturbances to the cardiovascular system had made it clear that in practice these effects are not of serious import. The same may apply to "Anavenol." One can only make a proper judgment of the matter when the results of a large series of anaesthesias, say some thousands, are available and can be correlated. If Messrs. Gold and Longley would refer once again to my paper in *The Veterinary Record*, to my communication to the XIVth International Veterinary Congress and to my letter in *The Veterinary Record* (**62.** 550) last September, they will see that I have stated specifically that a great deal more work was necessary before the value of "Anavenol" could be properly appraised, but that I considered on the basis of my own experience that the drug appeared sufficiently promising to warrant full-scale evaluation by clinicians in various parts of the world. Until adequately documented accounts of the use of "Anavenol" in veterinary practice become available, the final evaluation of its position must remain *sub judice*.

One last point regarding the occurrence of acute cardiac failure under anaesthesia: I am only too well aware that both in human and veterinary medicine it is extremely difficult to obtain any reliable information about such anaesthetic accidents, but that they do occur is undoubted. To obtain some evidence on this point, Steel and I have deliberately endeavoured, under experimental conditions, to induce cardiac disturbances with a number of anaesthetic agents (Steel, (1949.) *Proc. xiv Int. vet. Cong.*) and I can assure Messrs. Gold and Longley that it is perfectly possible by appropriate dosage and administration to induce "cardiopathic" disorders with a number of anaesthetics in common use in equine practice. I mention this, not to suggest that these findings are necessarily any contra-indication to the continued use of such drugs as chloral hydrate and chloroform, but merely to stress the point that any proper evaluation of the cardiovascular toxicity of an anaesthetic must be made in the light of the magnitude of the demand that this toxicity makes on the cardiovascular reserve as well as on the frequency of its occurrence during properly conducted administration.

Yours faithfully,

H. B. Parry.

Animal Health Trust,
Kennett,
Newmarket.

May 5th, 1951.

IMMUNISATION AGAINST RINDERPEST WITH LAPINISED VIRUS

Sir,—It was reported in *The Veterinary Record* of September 2nd, 1950, that 50 dairy cattle, highly susceptible to rinderpest, were vaccinated in Hong Kong with lapinised virus immediately after their arrival from Scotland in April, 1950: at the same time it was suggested that from time to time some of those animals would be challenged with bovine virus.

After the lapse of one year, the animals selected for this experiment were as follows:

A. An Ayrshire bull calf, six months old, not previously immunised against rinderpest.

B, C and *D.* Three Ayrshire cows vaccinated (as pregnant heifers) with lapinised virus immediately after arrival from Scotland in April, 1950: *B* and *C* at that time had shown thermal reactions of 104·4° F. and 104·6° F. respectively on the fourth day after inoculation: the reaction in the case of *D* was 104·4° F. on the sixth day.

E. A yearling Ayrshire heifer which, born at sea shortly before arrival in Hong Kong, was vaccinated in April, 1950, at the tender age of between one and two weeks. The only fever exhibited at that time by this calf was 102·8° F. on the third day after inoculation.

By courtesy of Mr. R. P. Jones, M.R.C.V.S., bovine virus was flown from Bangkok on April 25th, 1951, and inoculated into those five animals on April 26th with the following results.

A. The temperature, which commenced to rise on the fourth day, was maintained at about 105·0° F. to 106·0° F. until the eighth day, when the calf was destroyed. During this interval, typical symptoms of rinderpest—profuse nasal discharge, mouth lesions, inappetence and haemorrhagic diarrhoea—were observed.

B, C and D. None of those animals showed any signs of illness. On the morning of the sixth day *B* developed a temperature of 102·4° F.: this receded in the afternoon. The only fever shown by *C* was 102·4° F. and 103·2° F. respectively on the morning and evening of the fifth day: in the case of *D* the temperature remained normal throughout.

E. This heifer also showed no signs of illness: the temperature rose to 103·4° F. on the afternoon of the fifth day, and became normal on the following day.

It is evident that the immunity conferred on the four challenged animals by the use of lapinised virus in April, 1950, is still durable in April, 1951. It is hoped to challenge further animals from the group of 50 referred to above (which will not in the meantime receive any further vaccination) in April of succeeding years.

Yours faithfully,

H. C. Watson.

Dairy Farm, Ice & Cold Storage Co., Ltd.,
Hong Kong.
May 3rd, 1951.

* * * * *

MINERAL REQUIREMENTS OF DAIRY COWS

Sir,—Much of what it is necessary to say in reply to Mr. Bond's letter in *The Veterinary Record* of May 5th was said in my note in the previous issue of the same journal, which, of course, Mr. Bond had not seen when he wrote his last letter.

The importance to the national economy of good feeding for cattle is so great, however, that for such a motive, and not for mere polemical reasons, no matter how inviting, I should be grateful for a little more space in your correspondence columns to comment on Mr. Bond's theses and, incidentally, to bring my side of the correspondence to a definite end.

In his letter Mr. Bond quotes from one of the pages of Linton's "Animal Nutrition" (one of several pages, by the way, *which I cited* for his close attention!). He now admits that the figures he originally claimed to be there are in truth not there at all. Not even his suggested conversion of weights of oxides to corresponding ones of mineral elements will actually satisfy his claim, however, while intelligent perusal of the extract quoted by Mr. Bond shows clearly enough that there is no question of "standards" being involved. Mr. Bond carefully omitted to quote from one of the other pages to which his attention was drawn, since *possible* average and maximal daily intakes of calcium and phosphorus, together with a statement that too many other factors are likely to operate to make it safe to cling to any "standard," are clearly to be found there.

In the letter of May 5th, Mr. Bond now refers to his "own round figures" which "were intended only as a guide," but in his original article he described them as "safe and reliable." How "round"? How much of "a guide"? How "safe"? And how "reliable"? Is this a case of "you pays your money and you takes your choice," or, in the case of the farmer who is given insufficient information of the operative variables, of the unfortunate converse of that, namely, accepting ill-chosen data and paying for it by loss of efficiency?

Let me turn now to Mr. Bond's original article of April 7th, wherein reference is made to "recent balance experiments on cattle in the United States" and to studies carried out, in countries other than Britain, and chiefly in America. It would be interesting to have the actual references to this work, for Morrison (1948) quotes nothing more recent than about 1945 and in any case he says that he "has followed the recommendations of the special committee (N.R.C. Committee on Animal Nutrition: Recommended Nutrient Allowances for Dairy Cattle, No. III [1945]) concerning the amounts of calcium for dairy cattle." A revised edition (1950) of the above report is available and there are no relevant references in it later than 1935.

Far be it from me to decry the work of American investigators, who have reported their results with admirable clarity and their conclusions with reservations which Mr. Bond would have done well to quote. Anyone who chooses to adopt American findings in their entirety for application to the British Isles must in fairness compare and contrast American environments, systems of management, etc., with our own. Failing that, the postulates put forward as "safe and reliable" are in fact neither: they have little more validity than sheer guesswork. Furthermore, the study of nutrition has too often been bedevilled by fashionable and unscientific crazes involving particular groups of nutrients, such as proteins, minerals, etc., to the exclusion of consideration of the diet as a whole. I think we are in the midst of one now.

A letter to a journal is not the place in which to cite long lists of references, though these are available for those who are interested, so that I hope I shall be forgiven for offering for Mr. Bond's consideration the following general statements with reference to American work on calcium requirements:—

1. The whole of the U.S. lies south of latitude 49 N, while Britain lies north of latitude 50 N.

2. Over 20 years ago it was shown that the anti-rachitic power of sunlight in countries as far north as Britain tends to be poor.

3. Even the northern states of the U.S., such as Wisconsin and Minnesota, where some of the experiments have been done, enjoy an average of 2,600 hours of sunshine a year (with a daily summer average of ten hours) against Britain's figures of 1,700 hours or less.

4. American workers have been careful to stress the need for an ample provision of vitamin D on "low-calcium" rations.

5. The "low-calcium" rations have often consisted of hay cured in a sunny environment.

6. One finds, on consulting some of the records of such experiments, statements to the effect that there have been reductions in the calcium content of the plasma and bones, one animal out of four in negative calcium balance, bones 15 per cent. lighter when compared with controls, etc.

7. In experiments in which diets were fed which contained 0·18, 0·35 and 0·65 per cent. respectively of calcium, plus a vitamin supplement, there were reductions in plasma and bone calcium on withdrawing the supplement.

8. In other cases the "low-calcium" rations have been fed over a period of years at a constant daily level *but* that level was well above maintenance "standards" during the dry periods.

9. Low-calcium rations have been compared with high-calcium ones, but using a Ca/P ratio of 1 : 1 for the former and the less favourable 2 : 1 for the latter.

10. Experiment has shown that the absorption of calcium and phosphorus by cattle is seriously diminished by lack of vitamin D.

I hold no allegiance to any particular figure or group of figures, nor am I likely to do so until experiments, with controlled intakes of calcium, phosphorus and vitamin D, *under British conditions of management*, have provided them. Agriculture in this country has a much larger responsibility than before the war, together with a smaller safety margin for error, and I hold it foolhardy to accept as gospel figures which even the U.S. committee previously referred to describes as being "tentatively recommended" for *American* conditions. We do not want to find in 1956 that the guesswork of 1951 has put us in difficulties.

No, Sir, from the trend of Mr. Bond's article and letter I have the impression of one burying his head in the sands: mineral though they may be, I must decline to join him.

Yours faithfully,

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